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OVERCOMING DIFFICULTIES WITH
THE PUPAE OF *EUPROSERPINUS*
PHAETON MOJAVE (SPHINGIDAE)

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ON APRIL 18, 1957, I collected over 30 last instar larvae of *Euproserpinus phaeton mojave* Comst., in a small area near Llano, Los Angeles County, California (at 3200 feet elevation on the western Mojave Desert). Around 10:00 A.M., many of the larvae were feeding on certain species of the abundant small annuals that cover the desert after a winter of ample rainfall. Those observed feeding were eating *Coreopsis bigelovii* (Gray) Hall, and two small, annual *Oenothera* spp. Those not feeding were either crawling over the ground to other plants, or quietly sunning themselves on the warm sand.

Although the larvae are marked with black, pink, and white on a soft green ground-color, they do not stand out conspicuously when in the natural habitat, because during the short time they are present as nearly fullgrown larvae, the sand around them is covered (to a varying degree) with brightly-colored petals, both fresh and dry, which have fallen from the many ephemeral spring flowers. These fallen petals (which are mostly pink, white, yellow, or blue) blow over the sand and collect in small depressions, or underneath plants where the larvae are feeding and resting.

These collected larvae were transported to the Santa Monica Mountains near the coast (where I was living), and they were offered the leaves of the large, biennial *Oenothera hookeri* T. & G., which was accepted casually. Other possible foodplant substitutes were not available, but as most of the larvae were about to pupate, this was not a problem. In order to approximate conditions in the natural habitat, the larvae were placed outdoors, in a screen-covered 15-gallon aquarium, in the bottom of which



Fig. 1. *Euproserpinus monjave* (adult, 3 views of Larvae).

was about 3 inches of sand from the habitat. They showed an interest in active feeding *only* after they had had a sufficient sunning each morning. Soon, they burrowed into the sand to make underground cells, in which they all pupated successfully. The pupae were dug up about two weeks later, and were stored in a suitable container, indoors, for the diapause period (*i.e.* — from May, 1957 until the following March). During the diapause period, the pupae were kept nearly dry, but for an occasional sprinkling, and they were overwintered outdoors in Albuquerque, New Mexico, where I spent the school year of 1957-1958. (Winter temperatures in that locality approximate those on the high Mojave Desert). They remained in excellent condition the whole time, responding with abdominal movement when handled. However, when it came time for them to emerge (in March, 1958), problems developed. By late March, maculation on the forewings of the developing moths was easily visible through the pupal shells, so it was assumed that warmer temperatures, plus dampened soil, would bring about emergence in short order. The pupae were in a non-toxic, clear plastic box, on top of about one inch of the original sand from the habitat. The sand was then kept lightly damp. In most of the pupae, the moths were developed to the full extent, appearing ready to emerge at any moment, and at last they reached the final stage (just prior to emergence) where there is expansion between the abdominal segments of the pupa. But nothing happened thereafter! The pupae would not emerge after reaching that point of readiness; if they were opened by hand, the moths scrambled out in apparent good health, but the wings always failed to expand. If the pupae were left alone, the moths finally died within them, never emerging. When all but one of the pupae had been lost in one way or the other, something different was tried with the one remaining healthy pupa, which was ready to emerge in mid April. On April 18, 1958, the plastic box containing this pupa (lying upon damp sand), was placed in the sun at about noon. The box "steamed" inside. Shortly the moth emerged of its own accord! Then another detail was observed: The newly-hatched moth did *not* seek a place where it could climb up, in order to let its wings hang down as they expanded and dried (which is the normal procedure with most freshly-emerged moths). Instead, the moth continued to sit on the damp sand, in the sun, and its wings rapidly "mushroomed" straight *upward* as they expanded. Then they were held erect, over the thorax. Full ex-

pansion of the wings took less than one minute, once started. When the box was taken out of the sun for a moment, the moth showed immediate distress and began running about; its limp, newly-expanded wings fell down and dragged on the ground as the moth ran. Upon being replaced in the sun, the moth stopped running and the wings again went straight up, and were held that way (together) until dry. A few minutes later, the fully-developed moth was flying around inside the box. It was subsequently spread for the collection. (See the photograph of this reared specimen, and three unhatched pupae).

This account illustrates one of the difficulties sometimes encountered by those who would rear Lepidoptera — the problem of breaking pupal diapause, and/or causing emergence of the imago; this problem is very commonly encountered when attempting to rear species from arid regions. Although the treatment described above was successful with the diurnal, sun-loving *Euproserpinus*, that procedure would not necessarily succeed in causing emergence in very many other cases, except, possibly, with other diurnal desert moths. If such a technique is tried, the pupae should not be sun-warmed until the day they appear completely ready to emerge; then, the sun must not be too hot, the soil should be damp, and conditions in the container holding the pupae should be watched closely, to avoid over-heating.

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